

IN THE CLAIMS:

1 1. (Currently Amended) A system for indexing and manipulating backup data stored on a
2 destination storage system, comprising:

3 one or more source storage systems configured to transmit the backup data to the
4 destination storage system;

5 a management client comprising a processor configured to execute a management
6 application, the management application configured to communicate with the destination
7 storage system and further configured to access data identifiers related to the backup data
8 organized in a directory tree representing a plurality of persistent consistency point im-
9 ages (PCPIs) of the backup data, wherein each PCPI is associated with a creation time,
10 the management application further configured to scan the directory tree through at least
11 one volume information block configured to reference each root of each PCPI comprising
12 the directory tree to generate an index of directories, files, or qtrees associated with the
13 directory tree, the management application further configured to organize the data identi-
14 fiers to enable display of the backup data ~~to be displayed~~ on a display screen of the man-
15 agement client; and

16 a user interface of the management client configured to select a directory, a file,
17 or a qtree to view, and, in response to the selection, the management client further con-
18 figured to query the management application, and, in response to the query, further con-
19 figured to return a list of the selected directory, file, or qtree and one or more versions of
20 the selected directory, file, or qtree.

1 2. (Previously Presented) The system as set forth in claim 1 further comprising a database
2 coupled to the management client configured to store the data identifiers and rules for
3 handling the data identifiers for retrieval by the user interface and the management appli-
4 cation.

1 3. (Previously Presented) The system as set forth in claim 1 further comprising, in the
2 destination storage system, a network data management protocol (NDMP) extension

3 communicating with a storage operating system of the destination storage system and
4 providing NDMP-based communication between the management application and the
5 storage operating system.

1 4. (Currently Amended) The system as set forth in claim 3 further comprising a job man-
2 | agement framework of the management client, the job management framework config-
3 | ured to organize one or more backup operations and restore operations by the manage-
4 | ment application and that communicates with the user interface to enable a user to access
5 | information with respect to status of the backup operations and restore operations organ-
6 | ized by the job management framework.

1 5. (Currently Amended) The system as set forth in claim 1 further comprising a scheduler
2 | of the management client configured to interface with at least one of the one or more
3 | source storage systems, perform the backup operations, and transmit the backup data
4 | from the at least one source storage system to the destination storage system at a prede-
5 | termined time interval.

1 6. (Previously Presented) The system as set forth in claim 1 wherein the display screen of
2 the management client is configured to enable a user to set a desired lag time after which
3 failure to complete a scheduled backup operation causes an event to occur.

1 7. (Currently Amended) The system as set forth in claim 1 wherein the user interface of
2 the management client is further configured to select a listing of source data entries in-
3 | dexed by names of at least one of the one or more source storage systems and to select
4 | another listing of source data entries indexed by names of volumes of the destination stor-
5 | age system in which the backup data resides.

1 8. (Previously Presented) The system as set forth in claim 7 wherein the display screen of
2 the management client comprises a button configured to enable a user to view the backup

3 data stored on the destination storage system that is associated respectively with each of
4 the entries.

1 9. (Previously Presented) The system as set forth in claim 7 wherein the display screen of
2 the management client comprises a button configured to enable a user to view restorable
3 backup data structures with respect to each of the entries and to restore the backup data
4 structures.

1 10. (Currently Amended) The system as set forth in claim 1 wherein each qtree comprises
2 one or more qtree relationships with respect to other qtrees within at least one of the one
3 or more source storage systems.

1 11. (Previously Presented) The system as set forth in claim 1 wherein the user interface of
2 the management client comprises a command for destroying a qtree relationship between
3 source data and a selected volume of the backup data in the destination storage system.

1 12. (Previously Presented) The system as set forth in claim 11 wherein the management
2 application is further configured to delete a respective qtree associated with the qtree re-
3 lationship on the destination storage system in response to activation of the command for
4 destroying the qtree relationship.

1 13. (Previously Presented) The system as set forth in claim 1 wherein the display screen
2 of the management client is configured to enable selected data of source data to be listed
3 as entries and to be transmitted as the backup data to the destination storage system at a
4 time separate from a scheduled backup time.

1 14. (Currently Amended) A computer implemented method for indexing and manipulat-
2 ing backup data stored on a destination storage system from source data stored on a
3 source storage system, comprising:

communicating, by a management client, with the destination storage system and accessing data identifiers related to the backup data organized in a tree structure and representing a plurality of persistent consistency point images (PCPIs) of the data, each with associated information related to a creation time;

scanning the tree structure through at least one volume information block configured to reference each root of each PCPI comprising the tree structure to generate an index of directories, files, or qtrees created at different points in time;

organizing the data identifiers to enable display of the data ~~to be displayed~~ on a display screen of the management client according to the directory, the file, or the qtree; and

selecting, on a user interface of the management client, a specified directory, file, or qtree to view, and, in response to the selection, querying the management client, and, in response to the query, returning a list of the specified directory, file, or qtree created at different points in time.

15. (Previously Presented) The method as set forth in claim 14 further comprising storing, in a database coupled to the management client, the data identifiers and rules for handling the data identifiers for retrieval by the user interface and the management application.

16. (Previously Presented) The method as set forth in claim 14 further comprising providing, in the destination storage system, a network data management protocol (NDMP) extension communicating with a storage operating system of the destination storage system and providing NDMP-based communication between the management application and the storage operating system.

17. (Currently Amended) The method as set forth in claim 16 further comprising organizing, in a job management framework of the management client, one or more backup operations and restore operations by the management application and ~~that communicate~~

4 | escommunicating with the user interface to enable a user to access information with re-
5 spect to status of the backup operations and restore operations organized by the job man-
6 agement framework.

1 18. (Previously Presented) The method as set forth in claim 14 further comprising inter-
2 facing a scheduler of the management client with the source storage system and perform-
3 ing, at scheduled times, backup operations that transmit the backup data from the source
4 storage system to the destination storage system at a predetermined time interval.

1 19. (Previously Presented) The method as set forth in claim 18 further comprising ena-
2 bling a user to set a desired lag time after which failure to complete a scheduled backup
3 operation causes an event to occur.

1 20. (Previously Presented) The method as set forth in claim 14 further comprising select-
2 ing a listing of source data entries indexed by names of the source storage system and se-
3 lecting a listing of source data entries indexed by names of volumes of the destination
4 storage system in which the backup data resides.

1 21. (Previously Presented) The method as set forth in claim 20 further comprising ena-
2 bling a user to view, by the display screen of the management client, the backup data
3 stored on the destination storage system that is associated respectively with each of the
4 entries.

1 22. (Previously Presented) The method as set forth in claim 20 further comprising ena-
2 bling a user to view, by the display screen of the management client, restorable backup
3 data structures with respect to each of the entries and to restore the backup data struc-
4 tures.

1 23. (Previously Presented) The method as set forth in claim 14 wherein one or more of
2 each qtree comprises qtree relationships with respect to other qtrees within the source
3 storage system.

1 24. (Previously Presented) The method as set forth in claim 14 further comprising provid-
2 ing, by the user interface of the management client, a command for destroying a qtree
3 relationship between source data and a selected volume of the backup data in the destina-
4 tion storage system.

1 25. (Previously Presented) The method as set forth in claim 24 further comprising, in re-
2 sponse to activation of the command for destroying the qtree relationship, deleting a re-
3 spective qtree associated with the qtree relationship on the destination storage system.

1 26. (Previously Presented) The method as set forth in claim 14 further comprising provid-
2 ing, by the display screen of the management client, a view that enables selected data of
3 source data to be listed as entries and to be transmitted as the backup data to the destina-
4 tion storage system at a time separate from a scheduled backup time.

1 27. (Currently Amended) A method for managing backup of data, comprising:
2 scanning at least one volume information block referencing each root of a plural-
3 ity of persistent consistency point images (PCPIs) comprising a particular tree structure
4 stored on a destination storage system;
5 generating, by a management client operatively connected to the destination stor-
6 age system, an index of qtrees in response to scanning the volume information block ~~ref-~~
7 ~~erencing each root of the plurality of PCPIs~~, each qtree comprising one or more versions
8 created at different creation times;
9 selecting, by a query issued at the management client, a particular qtree to view of
10 the index of qtrees; and

11 displaying, on a screen of the management client in response to the query, each
12 version of the particular qtree created at the different creation times.

1 28. (Currently Amended) The method as set forth in claim 27 further comprising format-
2 | ting information at the destination storage system into a network data management proto-
3 | col (NDMP).

1 29. (Previously Presented) The method as set forth in claim 27 further comprising activat-
2 | ing, via the user interface, user interface buttons associated with entries of the displayed
3 | qtree.

1 30. (Currently Amended) A computer-readable storage medium containing executable
2 | program instructions executed by a processor, comprising:
3 | program instructions that scan at least one volume information block referencing
4 | each root of a plurality of persistent consistency point images (PCPIs) comprising a par-
5 | ticular tree structure stored on a destination storage system;
6 | program instructions that generate, by a management client operatively connected
7 | to the destination storage system, an index of qtrees in response to scanning the volume
8 | information block ~~referencing each root of the plurality of PCPIs~~, each qtree comprising
9 | one or more versions created at different creation times;
10 | program instructions that select, by a query issued at the management client, a
11 | particular qtree to view of the index of qtrees; and
12 | program instructions that display, on a screen of the management client in re-
13 | sponse to the query, each version of the particular qtree created at the different creation
14 | times.

1 31. (Currently Amended) The computer-readable storage medium as set forth in claim 30
2 | further comprising program instruction that format information at the destination storage
3 | system into a network data management protocol (NDMP).

1 32. (Currently Amended) A system, comprising:

2 a source storage system configured to generate a plurality of persistent consis-
3 tency point images (PCPIs) associated with a ~~particular~~ directory tree, and further config-
4 ured to transfer the plurality of PCPIs to a destination storage system;

5 a management client comprising a processor configured to execute a management
6 application, the management application configured to scan the ~~particular~~ directory tree
7 through at least one volume information block configured to reference each root of each
8 PCPI comprising the particular directory tree to organize the plurality of PCPIs into an
9 index using a database operatively connected to the management client configured to al-
10 low display of the plurality of PCPIs ~~to be displayed~~ on a display screen of the manage-
11 ment client as a listing of source data entries indexed by the ~~particular~~ directory tree, each
12 PCPI of the ~~particular~~ directory tree created at one or more different creation times, and
13 to allow display of the plurality of PCPIs ~~to be displayed~~ on the display screen as a listing
14 of source data entries indexed by names of the source storage system, and to allow dis-
15 play of the plurality of PCPIs ~~to be displayed~~ on the display screen as a listing of source
16 data entries indexed by names of volumes of the destination storage system in which
17 backup data from the source storage system resides; and

18 an interface of the management client configured to select a data entry for the ~~par-~~
19 ~~ticular~~ directory tree, and, in response to the selection, query the management application,
20 and, in response to the query, further configured to return a list of the plurality of PCPIs
21 associated with the ~~particular~~ directory tree.

1 33. (Previously Presented) The system of claim 32, wherein the database operatively cou-
2 pled to the management client is further configured to store the plurality of PCPIs and
3 rules for handling the plurality of PCPIs for retrieval by the interface and the manage-
4 ment client.

1 34. (Previously Presented) The system of claim 32, wherein the source storage system,
2 upon initialization, is further configured to send a base PCPI and select data to the desti-
3 nation storage system.

1 35. (Currently Amended) The system of claim 32, further comprising a scheduler of the
2 management client configured to interface with the source storage system and perform
3 one or more backup operations of transmitting the backup data comprising one or more
4 PCPIs of the plurality of PCPIs and change data from the source storage system to the
5 destination storage system at a predetermined time interval.

1 36. (Currently Amended) A computer implemented method, comprising:
2 transferring a plurality of persistent consistency point images (PCPIs) from a plu-
3 rality of source storage systems to at least one destination storage system;
4 scanning at least one volume information block referencing each root of the plu-
5 rality of PCPIs comprising a ~~particular~~ directory tree to create an index of data structures
6 of the at least one destination storage system, each data structure comprising a plurality
7 of qtree versions created at different creation times;
8 selecting a ~~particular~~ first data structure to view;
9 in response to the selection, querying the at least one destination storage system,
10 and in response to the querying, returning all qtree versions created at the different crea-
11 tion times for the ~~particular~~ first data structure; and
12 selecting a ~~particular~~ first qtree from ~~all~~ the returned qtree versions created at the
13 different creation times to restore.

1 37. (Currently Amended) A system, comprising:
2 at least one source storage system configured to transfer a plurality of persistent
3 consistency point images (PCPIs) to at least one destination storage system;
4 a management client operatively connected to the destination storage system and
5 comprising a processor configured to execute a management application, the manage-

6 ment application configured to scan a directory tree through at least one volume informa-
7 tion block configured to reference each root of each PCPI comprising the directory tree to
8 create an index of data structures of the at least one destination storage system, each data
9 structure comprising a plurality of qtree versions each created at different creation times;
10 the management application further configured to select a ~~particular~~first data
11 structure to view, and, in response to the selection, query the management application,
12 and, in response to the query, further configured to return all qtree versions created at the
13 different creation times for the ~~particular~~first data structure; and
14 a user interface of the management client configured to display on a display
15 screen of the management client ~~all~~ the returned qtree versions created at the different
16 creation times, and further configured to allow a user to select a ~~particular~~first qtree from
17 ~~all~~ the returned qtree versions to restore.